Fact Sheet:

September 1997

(LL 22)

LANDSCAPE MODELING AND VISUALIZATION

The Problem

Land managers on military installations must protect natural and cultural resources while ensuring optimal training use of military lands. This requires advanced tools for complex land-use planning and management. Standard geographic information systems (GIS) used for storing, analyzing, and displaying landscape data must be expanded to allow the users to work with temporal and volumetric data so that the development of surface and subsurface elements of landscape can be modeled and long-term consequences of land management decisions can be predicted.

The Technology

The U.S. Army Construction Engineering Research Laboratories (CERL) is enhancing the capabilities of the Geographic Resources Analysis Support System (GRASS) -- a tool used to store, combine, analyze, and display landscape data quickly and easily (see CERL Fact Sheet LL 12 - Geographic Resources Analysis Support System). Improvements are being made in the following areas:

1) Multivariate spline interpolation of geo-referenced data for computation of digital elevation models, spatial distribution of climatic phenomena, concentration of chemicals in 2D/3D/4D space and other continuous phenomena;

2) Topographic analysis for computation of terrain parameters related to shape of terrain and spatial distribution of water flow;
3) Advanced hydrologic modeling to simulate the rainfall-runoff processes during storm events;
4) Erosion and deposition risk assessment for various land-use alternatives using unit stream power theory approach;
5) Multidimensional dynamic cartography which integrates scientific visualization with computer cartography, allowing users to visualize and analyze the spatial data and models in three-dimensional space and time.

Benefits/Savings

The ability to visualize environmental landscape phenomena in 3-dimension and over time greatly enhances our ability to understand natural processes and explain them to others. In addition, where land degradation is occurring, an understanding of the processes in a spatial context facilitates proper selection and placement of remediation measures.

Status

A method to derive an accurate digital elevation model from distributed elevation data has been developed and validated with data from an experimental farm in Germany. Using this method, the spatial distribution patterns of soil erosion and deposition on the farm were accurately predicted. In addition, tools for 3-dimensional visualization of spatial data were developed and successfully applied to soil layer data at the farm.
The CASC2D model that simulates rainfall-runoff processes during storm events has been developed and delivered to the Waterways Experiment Station, Vicksburg, MS, for use in flood prediction and mitigation.
Color examples and further details on the modeling capabilities are available on the World Wide Web at http://www.cecer.army.mil/grass/viz/VIZ.html.

Point of Contact

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